

Interim Core Map Documentation for Northeastern Bulrush

Posted to EPA's GeoPlatform: July 2025

Draft Interim Core Map Developer: Compliance Services International (CSI)

Species Summary

The northeastern bulrush (*Scirpus ancistrochaetus*; Entity ID 823) is a monocotyledonous endangered plant found in the Northeastern US. The U.S. Fish and Wildlife Service (FWS) has not assigned designated critical habitat for the northeastern bulrush. This species is a wetland obligate plant that inhabits various wetland types that include sinkhole ponds, wet depressions, vernal pools, beaver flowages, and other riparian areas (FWS 2019a). The species is found in sandstone or sand substrate and tends to prefer fluctuating water level. Additional habitat information is provided in **Appendix 1**.

EPA Review Notes

The developers created this core map using the U.S. Environmental Protection Agency's (EPA) process available at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>. EPA reviewed the draft interim map and documentation and evaluated if: (1) the map and documentation are consistent with EPA's process; (2) areas included or excluded from the interim core map are consistent with the biology, habitat, and/or recovery needs of the species; (3) data sources are documented and appropriate; and (4) the GIS data and mapping process are consistent with the stated intention of the developer. EPA agrees that this map is a reasonable depiction of core areas for this species and was consistent with the agency's mapping process. This documentation was not prepared by EPA, but EPA may have edited this documentation for clarity or other purposes. Some views expressed in this documentation may not necessarily reflect the viewpoints of EPA or its staff.

The core map developed for this species is considered interim and can be used to develop pesticide use limitation areas (PULAs). This core map incorporates information developed by FWS and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS.

This core map does not replace or revise any range or designated critical habitat developed by FWS.

Description of Core Map

The core map for the northeastern bulrush is based on biological information, which was used to refine an extent determined by known location information for the species (points identifying extant population sites as of 2017), buffered by 3.5 kilometers (km) to account for uncertainty in the geospatial data processing step. The extant population sites were obtained from a map provided in the most recent Species Status Assessment (SSA) for the species (FWS 2019b). Other available known location information from the Global Biodiversity Information Facility (GBIF), iNaturalist, and NatureServe databases were not used for core map development due to precision/scale of the data or simply in favor of other recent datasets.

The core map developed in this document for the northeastern bulrush spans 60,437 acres (Figure 1). A summary of acreage by National Landcover Database (NLCD) land use type is provided in Table 1.

Based on EPA’s “best professional judgment classification” system, CSI has graded this core map as “moderate” (4) because assumptions were made when connecting species life history and/or biological needs (habitat preferences, water body descriptions, and foraging needs) to a Geographical Information System (GIS) dataset, in this case the National Wetlands Inventory (NWI 2023). Additionally, the georeferenced point location data representing extant population sites was performed manually. More information about this classification system and its definitions can be found in the core map process document (EPA 2024).

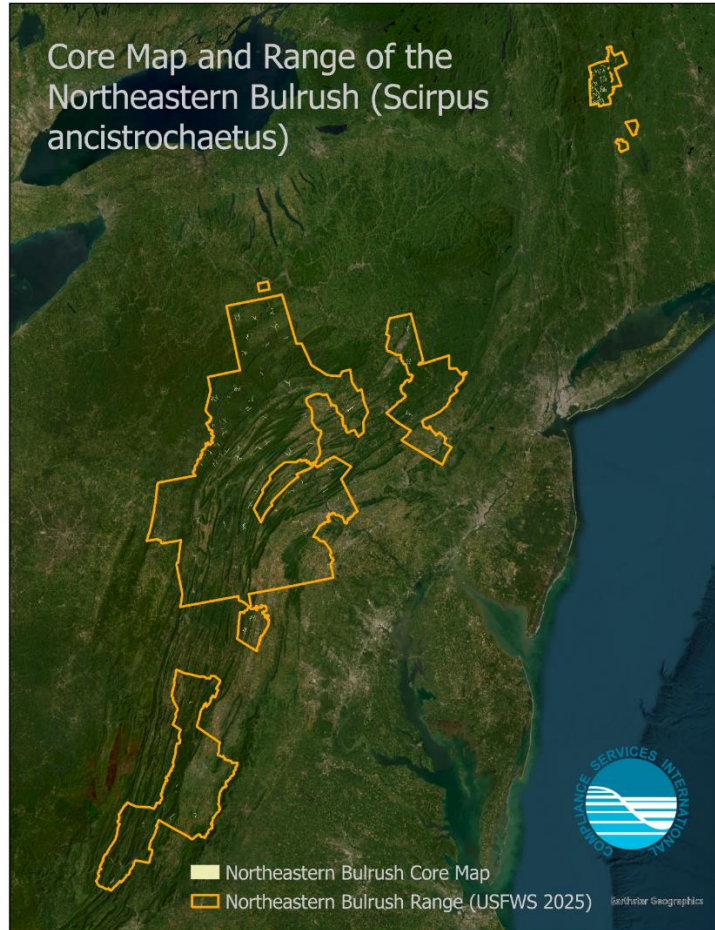


Figure 1. Interim core map for the northeastern bulrush.

NLCD_Land_Cover_Class	Acres
Deciduous Forest	19,307
Mixed Forest	12,467
Hay/Pasture	7,448
Developed, Open Space	5,172
Evergreen Forest	5,069
Open Water	2,989
Woody Wetlands	2,291
Developed, Low Intensity	2,276
Cultivated Crops	1,035
Developed, Medium Intensity	892
Emergent Herbaceous Wetlands	798
Herbaceous	220
Developed, High Intensity	199
Shrub/Scrub	162
Barren Land	107

Table 1. Acres by National Land Cover Database (NLCD) class within the core map of the northeastern bulrush. Total core map area (based on NLCD pixel count): 60,432 acres¹.

Evaluation of Known Location Information

There were four evaluated datasets with known location information:

- Descriptions of locations provided by UFWS;
- Occurrence locations in iNaturalist;
- Occurrence locations in Global Biodiversity Information Facility (GBIF); and
- Occurrence locations in NatureServe.

Compliance Services International (CSI) evaluated these four datasets before developing the core map. Overall, there were eight research-grade observations found in iNaturalist². The GBIF dataset comprised of 14 georeferenced observations. Both datasets were useful for comparison purposes across datasets, but did not otherwise contribute to the core map development process.

FWS location information includes extant population information that positively identifies areas of relevant occupancy, which can be brought into a GIS and contributes to the core map development process. These locations are consistent with species range and, based on the range's shape, could reasonably be assumed to be foundational to spatial range data development.

¹ This acreage is slightly different from the core map acreage (60,437) due to the pixelation of NLCD land cover. The core map is not developed from raster data.

² According to iNaturalist, an observation is designated as "research grade" if it 1) is verifiable with date, coordinates, photos/sounds, and not captive; 2) achieves community agreement defined as "more than 2/3 of identifiers needs to agree on the species level ID or lower;" and 3) "must pass a data quality assessment, which includes checks for accurate date and location, evidence of a wild organism, and clear evidence of the organism itself"

(<https://help.inaturalist.org/en/support/solutions/articles/151000169936-what-is-the-data-quality-assessment-and-how-do-observations-qualify-to-become-research-grade->).

NatureServe public element occurrence (EO) data were also evaluated and are considered by CSI to be more robust than the iNaturalist and GBIF datasets for this species. These data are displayed at a coarser resolution than could be obtained directly from FWS.

Approach Used to Create Core Map

The core map was developed using the process EPA uses to develop core maps for draft PULAs for species listed by FWS and their designated critical habitats² (referred to as “the process”). This core map was developed by CSI using the four steps described in the process document:

1. Compile available information for a species;
2. Identify core map type from among the following defined types: Designated Critical Habitat, Range, and Biological Information. From EPA, summaries of each core map type are provided below (EPA 2024).
3. Develop the core map for the species; and
4. Document the core map.

For step 1, CSI compiled available information for the northeastern bulrush from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for the northeastern bulrush is included in **Appendix 1**. Influential information that impacted the development of the core map includes a description of the species habitat from the FWS Species Status Assessment:

- “The northeastern bulrush is a wetland obligate plant occurring in acidic to circumneutral wetlands including sinkhole ponds, wet depressions, vernal pools (collectively, seasonal or ephemeral wetlands), beaver flowages, and other riparian areas found in hilly country (Service 1991). Northeastern bulrush requires water levels that fluctuate seasonally and/or annually as well as ample sunlight” (FWS 2019b).

For step 2, CSI used the compiled information including the species range, known locations, and habitat location information to determine the core map type. CSI compared the known location data to the range and found that known locations from larger databases (iNaturalist and GBIF) were limited in extent (area) compared to the range to be used as more than comparison with the core map. By contrast, known location information from FWS—specifically extant population sites—were considered the most appropriate data to use in this effort. The uncertainty in accuracy of the georeferencing process used informed the buffer distance (3.5 km) applied to convert point location data into polygonal area³.

Review of the available data also suggested that the core map should exclude landcover types inconsistent with the northeastern bulrush habitat. A national wetlands layer was used to represent reasonable potential habitat for this species. Additionally, the northeastern bulrush would not be expected to be found on agricultural land. When weighing this information together, CSI selected the biological information core map type. CSI used a combination of range, known observation/occurrence location data, habitat information, and EPA cultivated areas > 25 acres layer to derive this core map.

³ This distance corresponds to the uncertainty associated with the methodology of converting mapped points into a usable geospatial points layer. More detail is provided in Section 3.1.

For step 3, CSI used the best-available data sources to generate the core map. Data sources are discussed in the EPA's core map process document. For this interim core map, CSI followed EPA's decision framework to arrive at a core map type of biological information. Designated critical habitat was quickly eliminated as a core map type because the northeastern bulrush does not have a critical habitat. The range core map type was not used because the species range includes large, contiguous areas that likely include unoccupied areas. However, CSI judged that there was known occurrence/location data that would better represent the current distribution of extant populations of the species and used these data to refine the extent of the core map. That extent was established using extant population location sites across the species range. The National Wetlands Inventory (NWI) dataset was queried for classes relevant to the northeastern bulrush within its range to identify potential suitable habitat for this species. Finally, cultivated lands were removed from this area; this did not remove a substantial fraction of area because the habitat-based areas definitionally exclude cultivated land. **Appendix 2** provides more details on the GIS analysis and data used to generate the core map.

Discussion of Approaches and Data that were Considered but Not Included in Core Map

Non-FWS Known Observation Datasets

The known locations that were used for core map development represent extant population sites for the northeastern bulrush, according to FWS. Other occurrence data were considered but were not chosen in this case due to precision and scale of the data relative to information described in FWS documents.

Appendix 1. Information compiled for Northeastern Bulrush

1. Recent FWS documents

- 5-Year Review (2019): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2777.pdf
- Proposed Delisting (2024): <https://www.govinfo.gov/content/pkg/FR-2024-07-31/pdf/2024-16417.pdf#page=1>
- Recovery Plan (1993): https://ecos.fws.gov/docs/recovery_plan/930825.pdf
- Species Status Assessment (SSA) (2019): <https://iris.fws.gov/APPS/ServCat/DownloadFile/166510>
- Center for Plant Conservation (Undated) <https://saveplants.org/plant-profile/3878/Scirpus-ancistrochaetus/Northeastern-Bulrush/#:~:text=Sandstone%20or%20sand%20appears%20to,of%20a%20fluctuating%20water%20level.>

2. Background information

- Status: Federally listed as endangered in 1991. Population proposed for delisting in 2024.
- Resiliency, redundancy, and representation (the 3Rs) from the 2019 SSA
 - Regional Resiliency

Resiliency	EO Rank Group	Number of New England ³ Populations	% of New England Populations	Number of Appalachian ⁴ Populations	% of Appalachian Populations
Poor	D/E	4	8.3	12	12.0
Fair	C	13	27.1	29	29.0
Good	B	23	47.9	43	43.0
Excellent	A	8	16.7	16	16.0

Table 2. Regional resiliency of the northeastern bulrush. Copied from Table 4-3 of the 2019 Species Status Assessment. Footnote 3: Includes New Hampshire, Vermont, Massachusetts, and eastern New York. Footnote 4: Includes southwestern New York, Pennsylvania, Maryland, and West Virginia (FWS 2019).

- Redundancy
 - “The northeastern bulrush is now known from a large geographic area stretching approximately 600 miles from the northernmost populations in Merrimack County, New Hampshire, to the southernmost populations in Alleghany County, Virginia. This area comprises four physiographic provinces (figure 2-4), and the species’ redundancy continues to grow as more populations are discovered. Since listing, the number of known extant northeastern bulrush populations increased from 13 to 148, with only 9 populations considered extirpated. Excellent and/or good-resiliency populations occur in every occupied state, and occurrences persist in every state in which the species has been observed. The species’ distribution and physiographic diversity suggest it should be able to withstand large-scale climatic events or other disturbance.”
- Representation
 - Genetics

- “The available information indicates the northeastern bulrush generally demonstrates low genetic diversity across its range, especially in the New England region.”
 - Environmental Diversity
 - Habitat Diversity: “As discussed above, the northeastern bulrush occurs in two habitat types— ephemeral wetlands and beaver-influenced wetlands. Both habitat types occur rangewide, although a much higher percentage of populations in the New England region occur in beaver wetlands than in the Appalachian region—60.4 percent versus 3 percent, respectively. While the two habitat types appear equally suitable for the species at this time, we reason that the two habitats have differences that diversify the species’ potential adaptive response.”
 - Physiographic Provinces: “There are extant populations of the northeastern bulrush in four physiographic provinces (figure 2-4): New England, Valley and Ridge, Appalachian, and Blue Ridge. There are dozens of populations in the New England and Valley and Ridge Provinces, with fewer in the Appalachian Plateau, and at least one in the Blue Ridge. Each physiographic province provides different geology, topography, climatic variability, soils, and other characteristics that drive biotic and abiotic environmental diversity and adaptive pressures, and the species’ persistence in these areas demonstrates increased adaptive capacity.”
- Habitat, Life History, and Ecology
 - Habitat: “The northeastern bulrush is a wetland obligate plant occurring in acidic to circumneutral wetlands including sinkhole ponds, wet depressions, vernal pools (collectively, seasonal or ephemeral wetlands), beaver flowages, and other riparian areas found in hilly country (Service 1991). Northeastern bulrush requires water levels that fluctuate seasonally and/or annually as well as ample sunlight” (FWS 2019a).
 - Soils: “optimal habitat includes fluctuating water levels, little canopy cover, and acidic to circumneutral soils with high organic matter” (FWS 2019B). “Sandstone or sand appears to be its favored substrate, and sites tend to share the common feature of a fluctuating water level” (Center for Plant Conservation, Undated).
 - Pollinators: Pollinators are not listed.
 - Reproduction: “The species can reproduce sexually and clonally, but successful sexual reproduction and dispersal appears rare, resulting in clonal populations with clumped distributions and almost no genetic diversity” (FWS 2019b).
- Taxonomy
 - Wetland Plant – “The northeastern bulrush is a member of the sedge family (Cyperaceae) native to the northeastern United States. It was first described as a new species by A.E. Schuyler in 1962 (Schuyler 1962, entire) and is 1 of 18 species in North America of a natural group of leafy bulrushes within the genus *Scirpus*. Based on the morphological and genetic evidence, as well as the botanical expertise of A.E. Schuyler with the genus *Scirpus*, the Service recognizes it as a species” (FWS 2019B).
- Relevant Potential Pesticide Use Sites
 - Herbicides and fertilizer runoff are listed as the primary threat to a population in Monroe County, Pennsylvania (FWS 1993).

- Relevant Recovery Criteria and Actions
 - 5-Year Review (2019): Downlisting Criteria (reclassification to threatened would be initiated when the following have been met)
 - 20 populations are permanently protected;
 - Annual monitoring over a 10-year period shows that 20 representative populations are stable or increasing; and
 - Life history and ecological requirements are understood sufficiently to allow for effective protection, monitoring, and management.

The previous 5-year review (Service 2009) determined the downlisting criteria identified in the Plan were only partially met, the Service recommended a change in listing status to threatened, because (1) the number of extant populations was three times greater than when the species was listed; (2) approximately half of all known populations were on public lands; and (3) approximately half of the extant populations appeared to be stable or increasing.
 - The Recovery Plan does not contain delisting criteria. However, the 5-Year Review (FWS 2019a) and the SSA (FWS 2019b) both suggest that the northeastern bulrush does not meet the definition of threatened or endangered.

3. Description of Species Range

- “Historical collections of *S. ancistrochaetus* have been documented from Pennsylvania and New York, and possibly Virginia, but to date no historical collections have been confirmed from the other states within the species’ range” (FWS 1993).

“Populations can be loosely organized into northern and southern “regions” with a large gap in the distribution in southeastern New York (figure 2-6). These regions are consistent with the “evolutionarily significant units” recommended in Cipollini et al. (2017, p. 76) and provide an additional aspect, along with the rangewide distribution, with which to analyze the 3Rs. The northern or New England region includes extreme eastern New York and the New England states of Vermont, New Hampshire, and Massachusetts; and the southern or Appalachian region includes southwestern New York, Pennsylvania, Maryland, Virginia, and West Virginia. The vast majority of populations are in Pennsylvania (59.5 percent), Vermont, (20.9 percent), and New Hampshire (9.5 percent)” (FWS 2019B).

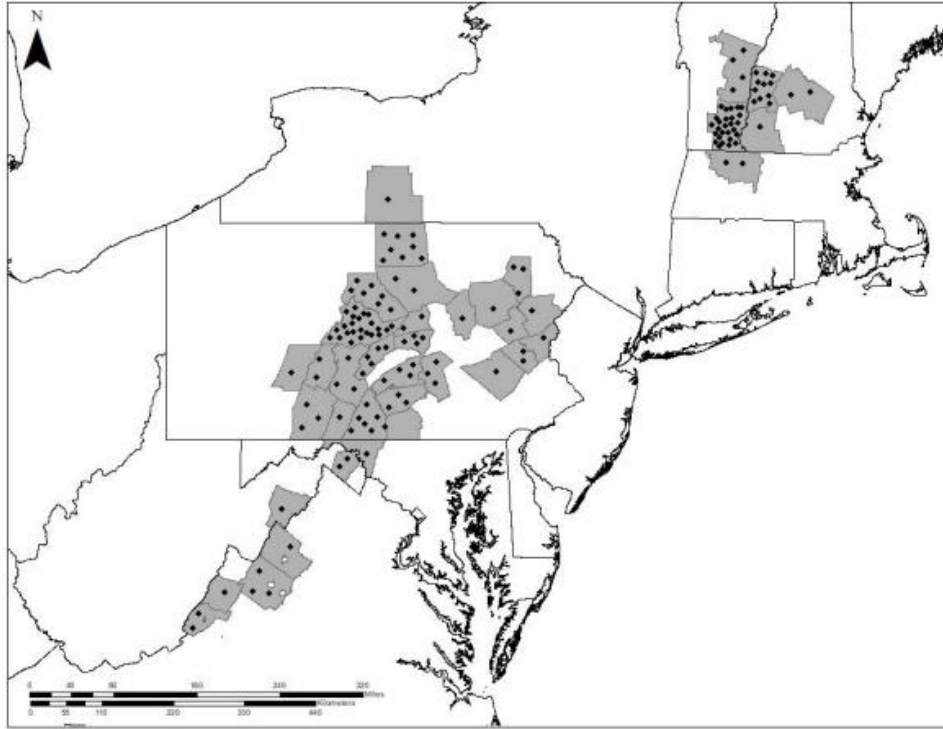


Figure 2. Extant populations of the northeastern bulrush in 2017. Copied from Figure 2-6 in the most recent SSA (FWS 2019).

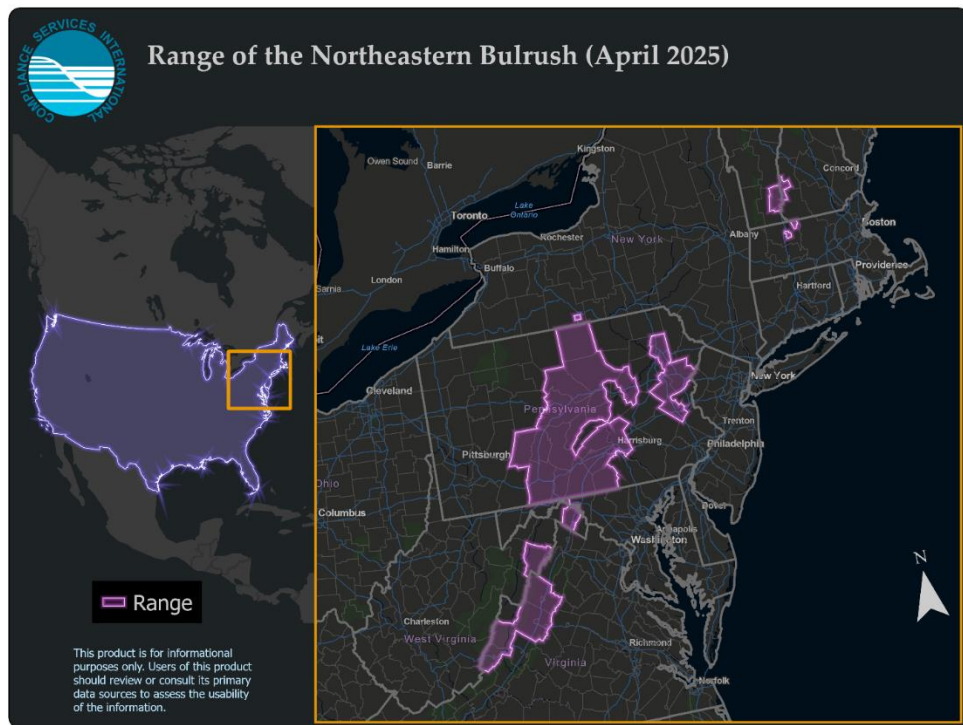


Figure 3. Range of the northeastern bulrush (FWS 2025).

4. Critical Habitat

The northeastern bulrush does not have designated critical habitat.

5. Known Locations

- FWS
 - “Currently, there are 148 known extant populations of the northeastern bulrush distributed across a 600-mile north/south range in 4 physiographic provinces and 2 habitat types” (FWS 2019a).

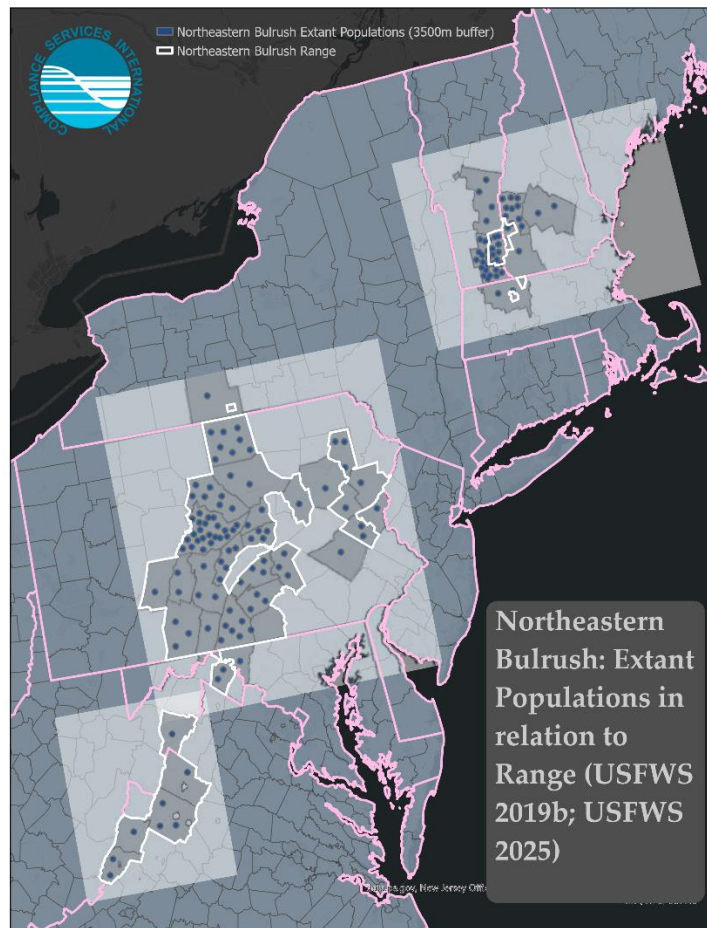


Figure 4. Extant populations in relation to range of the northeastern bulrush (FWS 2019b; FWS 2025).

- iNaturalist: https://www.inaturalist.org/observations?taxon_id=118746
 - Eighteen verifiable observations, eight of which are research-grade with public coordinate data (Figure 5).
 - These locations align well enough with species range and the known extant populations in 2017 to corroborate those data; however, the iNaturalist observations are less robust and so are limited in their utility beyond comparison to other datasets. There was one non-research grade observation outside of the species range, in northern New York.

Observations

Northeastern Bulrush

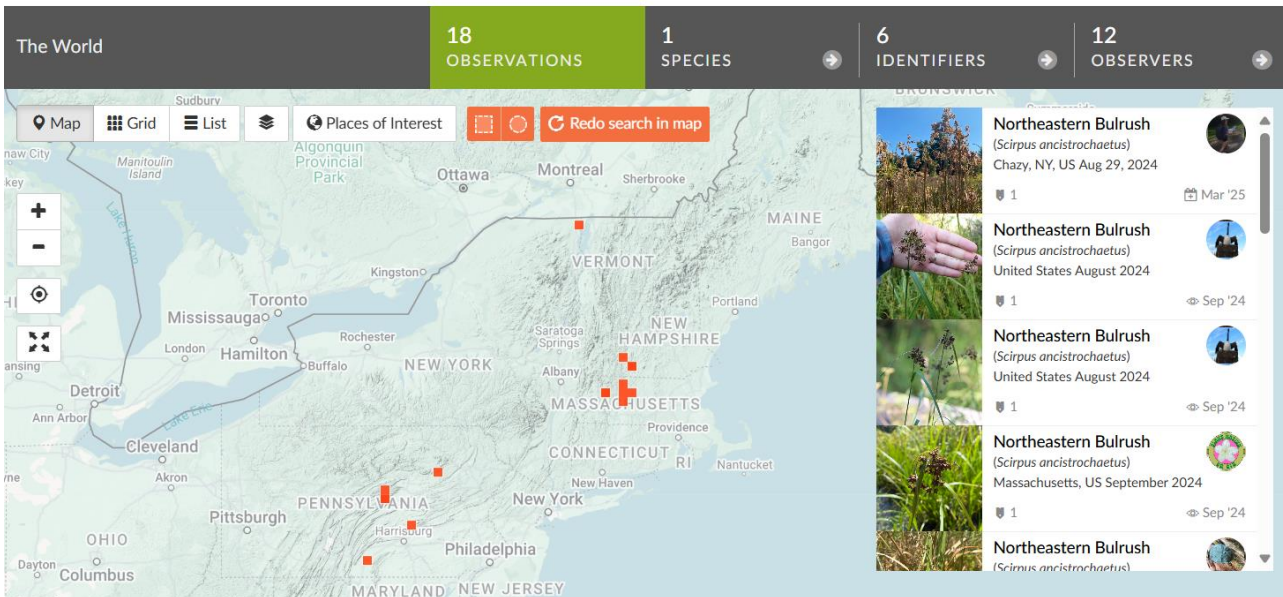


Figure 5. iNaturalist occurrences for the northeastern bulrush.

- GBIF: <https://www.gbif.org/species/2720264>
 - GBIF includes 398 occurrence records; 14 of which are georeferenced. Ten of these had usable coordinate data based on latitude/longitude precision (3+ decimal places) and relative recency (2010-present).

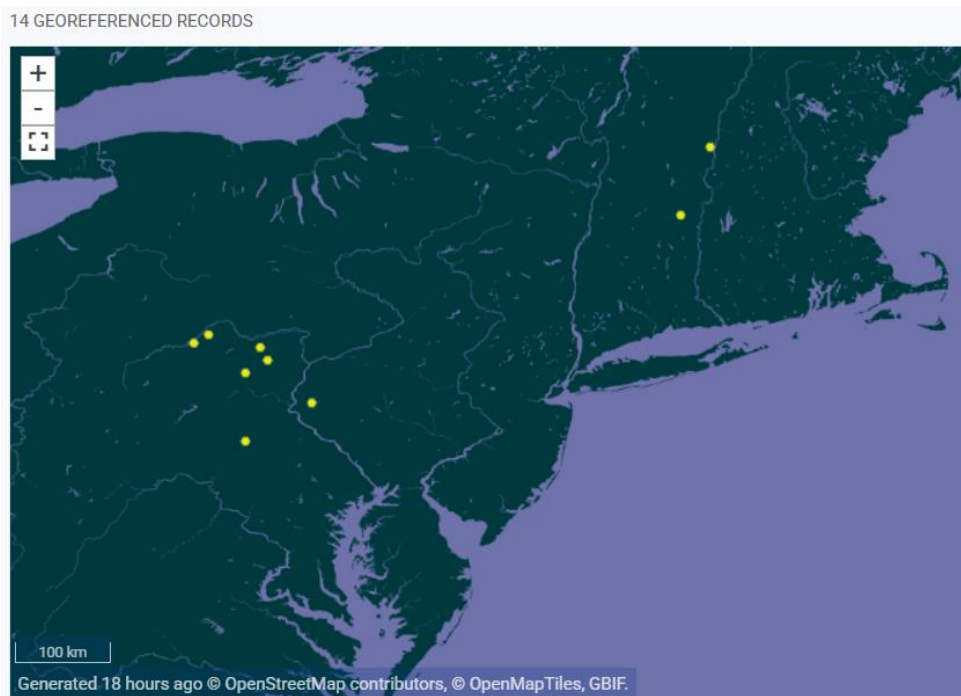


Figure 6. GBIF occurrences of the northeastern bulrush.

- NatureServe Explorer: <https://explorer.natureserve.org/>
 - Available public EO information from NatureServe Explorer is generally consistent with FWS range. However, the precision of these public EOs is less than the known extant populations provided in FWS documentation. Eos can be queried at <https://explorer.natureserve.org/>.

Appendix 2. GIS Data Review and Method to Develop Core Map

The core map for this species is based on biological information, which includes the habitat used by this species found within a spatial extent based on known observations. The core map identifies all areas within the extent (described below) matching its habitat description of “wetlands including sinkhole ponds, wet depressions, vernal pools... beaver flowages, and other riparian areas,” using professional judgment to match classes in the NWI dataset (FWS 2023). The NWI dataset is regarded as a high quality national-level dataset that is appropriate to identify aquatic habitat for bird species such as the northeastern bulrush.

1. References and Software

- National Wetlands Inventory: <https://www.fws.gov/program/national-wetlands-inventory>.
- Software used: ArcGIS Pro version 3.2.
- EPA Modified Cultivated Layer: <https://cdn.arcgis.com/home/item.html?id=159e70ce4c284f5b972c687037f8a668>.
- FWS Species Range: <https://ecos.fws.gov/ecp/species/6715>.
- Species Status Assessment (SSA) (2019): <https://iris.fws.gov/APPS/ServCat/DownloadFile/166510>

2. Datasets Used in Core Map Development

2.1. Range

The range for this species was last updated on November 16, 2022. A shapefile including species range for all listed species was downloaded from the FWS ECOS website on January 24, 2025. The shapefile was converted to a feature class stored in a file geodatabase and reprojected to WKID #4269 (“North America Albers Equal Area Conic”).

1. Using an ArcGIS Web Map the species was queried based on the ECOS listed “Entity ID” of 823 and exported as a feature class to a temporary file geodatabase as a standalone Entity ID-specific layer.
2. The area of the range was calculated automatically by loading it into the software (ArcGIS Pro version 3.2) and reading its area from the attribute table (“Shape_Area”), then converting its units (square meters) into acres with a conversion rate of 0.000247105.
3. This shapefile was added to an ArcGIS Pro map and compared against the available known locations described in the FWS Species Status Assessment (SSA), and the available occurrence information from the GBIF, iNaturalist, and NatureServe databases.

2.2. FWS Species Status Assessment (SSA; FWS 2019b)

The most recent SSA for the northeastern bulrush includes a map identifying extant populations of the species; these locations may have been used by FWS to inform the county-based species range (Figure 4). Three images—subsets of Figure 2—were copied and saved as standalone files that were georeferenced

according to the process detailed in Section 3 below. Once these point data were georeferenced, points were buffered by 3.5 km and then dissolved as part of the process of establishing core map extent.

2.3. National Wetlands Inventory

The NWI dataset was preliminarily vetted to determine its appropriateness in representing aquatic areas matching descriptions of the northeastern bulrush habitat. The northeastern bulrush inhabits different types of wetland areas as described above, all of which are included in the NWI dataset.

The NWI is publicly available as state-level downloads. For each state intersecting with the species range (Massachusetts, New Hampshire, New York, Pennsylvania, Vermont, Virginia, and West Virginia), the state-level NWI dataset was clipped to buffered extant population locations and then merged into a single dataset. Then the “Attribute” field was examined to match to species wetland types using a key developed by FWS (FWS 2013). Professional judgment was used to select only water body types matching the habitat description for the northeastern bulrush (FWS 2013):

- Riverine systems included only the “Unconsolidated Bottom” class and “Sand” subclass.
- Lacustrine systems were comprised of littoral subsystems, “Unconsolidated Shore” class, and “Sand” subclass.
- Palustrine systems included “Unconsolidated Shore” class, and “Sand” subclass.

The resulting ATTRIBUTE classes were the following:

- 'L1UBH','L1UBHh','L1UBHx','L2AB3Hh','L2ABFh','L2ABH','L2EM2Hh','L2UBH','L2US2Ah','L2USAh','L2USch','PAB/UBH','PAB3/UBH','PABF','PABFb','PABFh','PABH','PABHb','PABHh','PABHx','PEM1/AB4Fb','PEM1/FO1A','PEM1/FO1C','PEM1/FO1Fb','PEM1/FO4A','PEM1/FO4B','PEM1/SS1A','PEM1/SS1C','PEM1/SS1E','PEM1/SS1Eb','PEM1/SS1Eh','PEM1/UBF','PEM1/UBFh','PEM1/USC','PEM1A','PEM1Ad','PEM1Ah','PEM1B','PEM1Bb','PEM1C','PEM1Cb','PEM1Cd','PEM1Ch','PEM1Cx','PEM1E','PEM1Eb','PEM1Ed','PEM1Eh','PEM1F','PEM1Fb','PEM1Fh','PEM1Fx','PEM1J','PEM2F','PEM5/AB3Fh','PEM5/UBFh','PEM5/UBFx','PEM5A','PEM5B','PEM5C','PEM5Cx','PEM5E','PEM5Eh','PEM5F','PFO/EM1A','PFO/SS1Ba','PFO/SS1E','PFO/SS1Eb','PFO1/3B','PFO1/4A','PFO1/4B','PFO1/4C','PFO1/4E','PFO1/5F','PFO1/EM1A','PFO1/EM1C','PFO1/EM1E','PFO1/EM5A','PFO1/SS1A','PFO1/SS1C','PFO1/SS1Ch','PFO1/SS1E','PFO1/SS1Eh','PFO1/SS1F','PFO1/SS4A','PFO1A','PFO1B','PFO1C','PFO1Cd','PFO1E','PFO1Eb','PFO1F','PFO1Fb','PFO1Fh','PFO1Fx','PFO2B','PFO2C','PFO2E','PFO4/1A','PFO4/1Ba','PFO4/1C','PFO4/1E','PFO4/2Ba','PFO4/EM1A','PFO4/EM1B','PFO4/EM5A','PFO4/SS1A','PFO4/SS1Ba','PFO4/SS1C','PFO4/SS1E','PFO4/SS3E','PFO4/SS4E','PFO4A','PFO4B','PFO4Ba','PFO4C','PFO4E','PFO4Eb','PFO4Eh','PFO5/AB3Fh','PFO5/EM1F','PFO5/EM1Fb','PFO5/SS1F','PFO5/SS1Fb','PFO5/SS1Fh','PFO5/UBH','PFO5F','PFO5Fb','PFO5Fh','PFO5H','PFO5Hh','PSS/EM1A','PSS/EM1C','PSS/EM1E','PSS/EM1F','PSS1/3B','PSS1/3E','PSS1/4E','PSS1/EM1A','PSS1/EM1B','PSS1/EM1C','PSS1/EM1E','PSS1/EM1Eb','PSS1/EM1Eh','PSS1/EM1Fb','PSS1/EM5A','PSS1/EM5Ad','PSS1/EM5B','PSS1/EM5C','PSS1/EM5E','PSS1/EM5Eb','PSS1/FO1A','PSS1/FO1C','PSS1/FO1E','PSS1/FO4E','PSS1/FO4Eh','PSS1/UBFb','PSS1A','PSS1Ad','PSS1Ah','PSS1B','PSS1Ba','PSS1C','PSS1Cb','PSS1Cd','PSS1Ch','PSS1E','PSS1Eb','PSS1Eh','PSS1Ex','PSS1F','PSS1Fb','PSS1Fh','PSS4/EM1A','PSS4/EM1B','PSS4E','PUB/ABHh','PUB/EM1F','PUB/EM1Fh','PUB/FO5Fb','PUB/FO5Fh','PUBF','PUBFb','PUBFh','PUBFx','PUBGh','PUBGx','PUBH','PUBHb','PUBHh','PUBHx','PUS/SS1A','PUSCb','PUSCh','R2UBFx','R2UBH','R2UBHh','R2UBHx','R2USA','R2USC','R3RBH','R3UBF','R3UBFx','R3UBH','R3USA',

'R3USC','R4SBA','R4SBC','R4SBCx','R5UBFx','R5UBH'

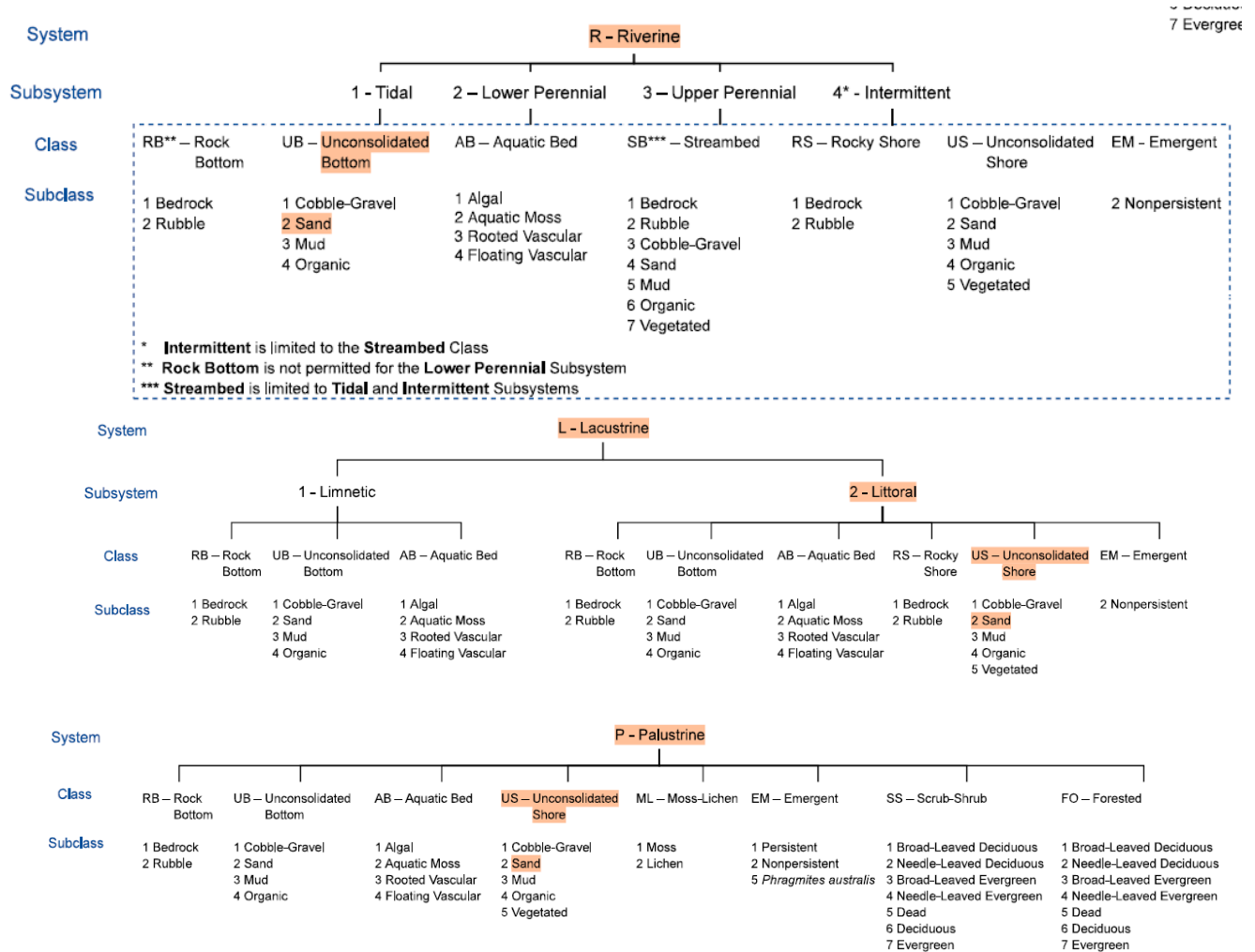


Figure 7. National Wetlands Inventory (NWI) attributes matched to the northeastern bulrush habitat description (highlighted, FWS 2013).

2.4. EPA Cultivated Lands Layer

EPA has developed and published its own cultivated layer for use in core map development as a potential refinement of extent. For the northeastern bulrush, extent was refined by this layer using the Pairwise Erase tool to remove significant areas of agriculture because the species habitat is not consistent with cultivated land and is therefore considered by CSI to be “off-field.” This removed relatively little area but is considered a reasonable refinement for core map development for off-field species.

3. Creating the Core Map

3.1. Developing Extent

The northeastern bulrush core map type is based on biological information/habitat. As the first part of the processing of developing this core map, a methodology was developed to define the outer contours of core

map extent. In researching whether suitable alternatives existed for this extent besides species range, CSI determined that the species extent could be represented by extant population locations, buffered by 3.5 km, due to uncertainty. This distance approximates the radius of each point depicted as a circle on the georeferenced image, and therefore, is associated with the uncertainty of the core map methodology (as opposed to a species-specific consideration).

Each of three images (NB_1, NB_2, and NB_3) were georeferenced according to the procedure below, using NB_1 as the example.

Converting images into usable core map extent

1. Within the working geodatabase, create a new empty points feature class (“NB_pts”).
2. Save images of the extant populations map (Figure 8, left) as an image file. Add the image to the GIS and save it to the working file geodatabase (“NB_1”, “NB_2”, “NB_3”). Fit the image to a window zoomed into the vicinity of the species range, render it partially transparent (70% transparency was used) and use control points to reorient the image to be aligned with identifiable features in the background.
3. Edit the empty points feature class using the Point tool to manually create points centered as precisely as possible on the centers of the circles identifying extant populations in the georeferenced layer. Save edits.
4. Use the Pairwise Buffer tool to buffer the previous layer (“NB_pts”) by 3.5 km and save as a new layer (“NB_pts_pb3500m”).
5. Use the Pairwise Clip tool to clip the previous layer (“NB_pts_pb3500m”) by the species range (“NB_range”), and save as a new layer (“NB_pts_pb3500m_pcRange”). Additionally export this layer with a new file name, “NB_extent.”

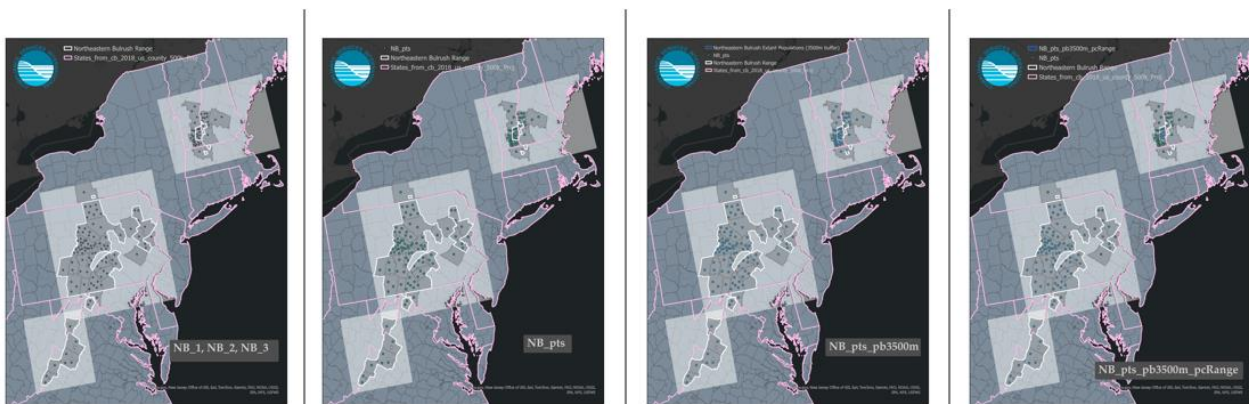


Figure 8. Development of the core map extent of the northeastern bulrush. A georeferenced image (left) was used to create a points layer (left-middle), buffered by 3.5 km (right-middle), and clipped to species range (right).

1.1. Habitat-based Refinement

1. Download NWI state-level data for seven states: Massachusetts, New Hampshire, New York, Pennsylvania, Vermont, Virginia and West Virginia.
2. For each state, use the Pairwise Clip tool to clip the NWI dataset by the core map extent (“NB_extent”) and save as new respective layers (“NWI_{state abbreviation}_pcNBpb3500mpcRange”).

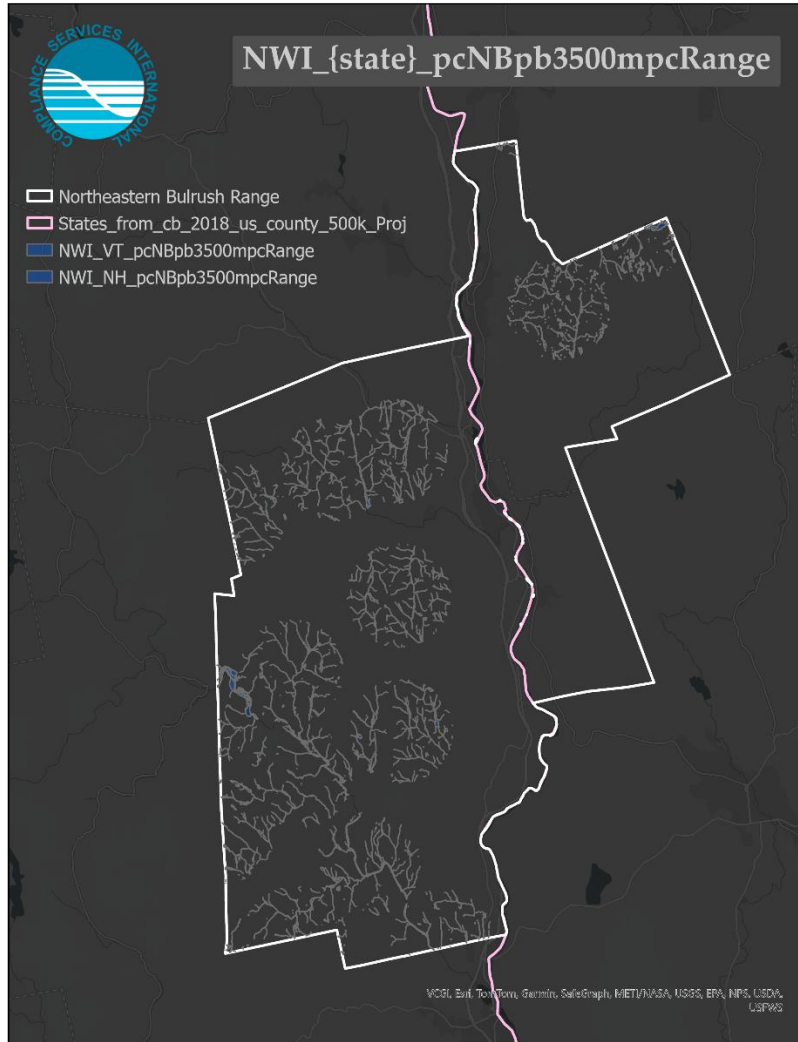


Figure 9. Select NWI wetlands within the core map extent, by state. New Hampshire and Vermont layers shown.

3. Use the Merge tool to merge the datasets created in the previous step into a single layer representing NWI waterbodies within the species extent. Save as a new layer (“NWI_pcNBextent”).
4. Use the Pairwise Dissolve tool to dissolve the previous layer (“NWI_pcNBextent”) by the field name “ATTRIBUTE” and save as a new layer (“NWI_pcNBextent_pdAttribute”).
5. Use the Select tool on the previous layer (“NWI_pcNBextent_pdAttribute”) for only select wetland type (“ATTRIBUTE”) classes appropriate for the habitat of the Northeastern Bulrush (ATTRIBUTE IN ('L1UBH','L2US2Ah','L2USAH','L2USCh','PUS/SS1A','PUSCb','PUSCh','R2UBFx','R2UBH','R2UBHh','R2UBHx','R3UBF','R3UBFx','R3UBH')) and save as a new layer (“NWI_pcNBextent_pdAttribute_sel”).
6. Use the Pairwise Dissolve tool on the previous layer (“NWI_pcNBextent_pdAttribute_sel”) to dissolve features into a single shape (“NWI_pcNBextent_pdAttribute_sel_pd”).
7. Use the Pairwise Buffer tool on the previous layer (“NWI_pcNBextent_pdAttribute_sel_pd”) to buffer by 100 meters, to include any stream- or lake-shore areas potentially inhabited by the species. Save as a new layer (“NWI_pcNBextent_pdAttribute_sel_pd_pb100m”). Choose Dissolve Type = “Dissolve all output features into a single feature.”

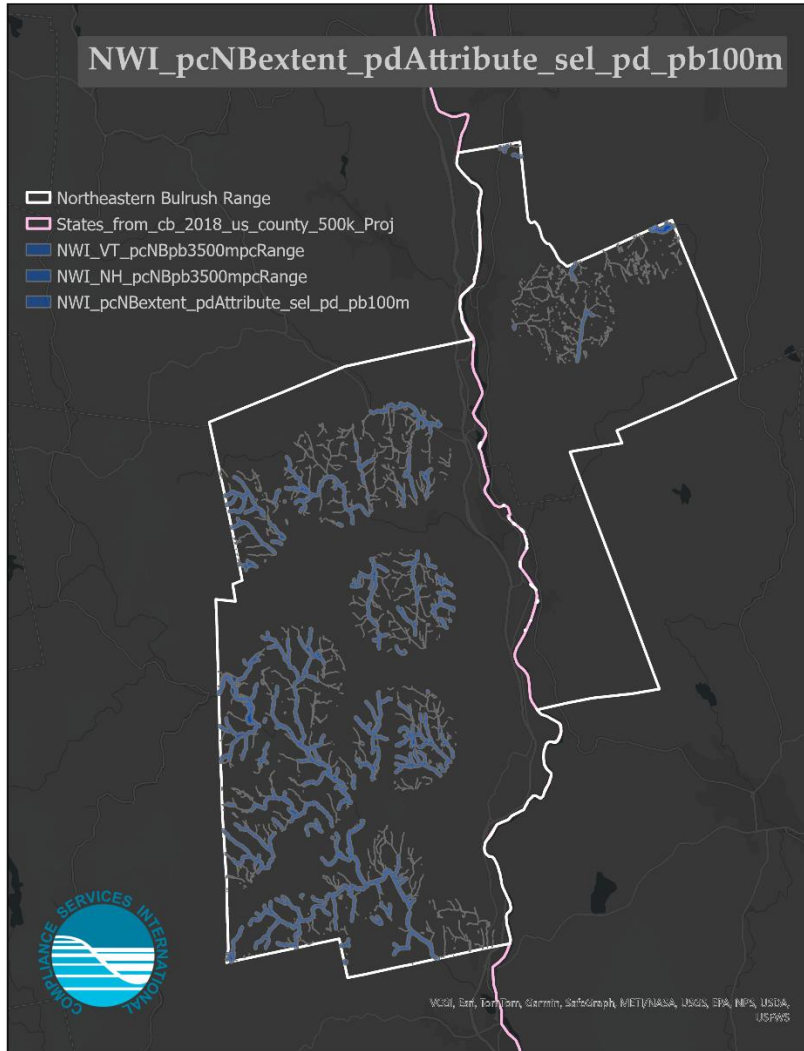


Figure 10. NWI wetlands buffered by 100 meters within the core map extent.

1.1. Cultivated Lands-based Refinement

1. Use the Pairwise Erase tool to exclude cultivated areas > 25 acres according to a layer developed by EPA (“CultivatedAreas_Over25acres”). Save as a new layer (“NWI_pcNBextent_pdAttribute_sel_pd_pb100m_peCultivated25ac”).
2. Export previous layer as a new layer identifiable as the species core map (“NB_CoreMap”).



Figure 11. NWI wetlands buffered by 100 meters with cultivated lands > 25 acres removed. This was exported to form the core map.

References

Documents

- U.S. Environmental Protection Agency. 2024. Process EPA Uses to Develop Core Maps for Pesticide Use Limitation Areas. Accessed April 25, 2025. <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>.
- U.S. Fish and Wildlife Service. 1993. *Northeastern Bulrush Recovery Plan*. Accessed April 25, 2025. https://ecos.fws.gov/docs/recovery_plan/930825.pdf.
- U.S. Fish and Wildlife Service. 2013. *Wetlands and Deepwater Habitats Classification*. Accessed April 25, 2025. <https://www.fws.gov/program/national-wetlands-inventory/classification-codes>.
- U.S. Fish and Wildlife Service. 2019a. *Northeastern Bulrush (Scirpus ancistrochaetus) 5-Year Review*.

Accessed April 25, 2025. https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2777.pdf.

- U.S. Fish and Wildlife Service. 2019b. *Species Status Assessment Report for the Northeastern Bulrush (Scirpus ancistrochaetus)* Version 4. Accessed April 25, 2025. <https://iris.fws.gov/APPS/ServCat/DownloadFile/166510>.
- U.S. Fish and Wildlife Service. 2024. *Endangered and Threatened Wildlife and Plants; Removal of Northeastern Bulrush From the Federal List of Endangered and Threatened Plants*. Federal Register 89, no. 147: 61387-61392. <https://www.govinfo.gov/content/pkg/FR-2024-07-31/pdf/2024-16417.pdf>.
- U.S. Fish and Wildlife Service. 2025. *Northeastern Bulrush (Scirpus ancistrochaetus)*. Accessed April 25, 2025. <https://ecos.fws.gov/ecp/species/6715>.

Spatial Data & Software

- Center for Plant Conservation. "Plant Profile: Northeastern Bulrush (*Scirpus ancistrochaetus*)."
<https://saveplants.org/plant-profile/3878/Scirpus-ancistrochaetus/Northeastern-Bulrush/#:~:text=Sandstone%20or%20sand%20appears%20to,of%20a%20fluctuating%20water%20level>.
- GBIF Secretariat. "*Scirpus ancistrochaetus* (Barbed Bristle Bulrush)." *GBIF Backbone Taxonomy*. Accessed April 25, 2025. <https://www.gbif.org/species/2720264>.
- iNaturalist. "Northeastern Bulrush (*Scirpus ancistrochaetus*)."
https://www.inaturalist.org/observations?taxon_id=118746. Accessed April 25, 2025.
- NatureServe. 2025. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available <https://explorer.natureserve.org/>. Accessed April 25, 2025.
- U.S. Environmental Protection Agency. 2025. Modified Cultivated Layer. Accessed April 1, 2025. <https://cdn.arcgis.com/home/item.html?id=159e70ce4c284f5b972c687037f8a668>.
- U.S. Fish and Wildlife Service. *National Wetlands Inventory*. 2023. Accessed April 25, 2025. <https://www.fws.gov/program/national-wetlands-inventory>.
- Software used: ArcGIS Pro version 3.2.